

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-7 (canceled)

8. (currently amended) A ground and line fault interrupter module comprising:

~~an adapter module which includes electrical ground and line fault interrupter circuitry wherein said electrical ground and line fault interrupter circuitry includes:~~

~~at least one a magnetic core, wherein load wires of a three phase electrical circuit extend through said magnetic core, and wherein said magnetic core is capable of detecting a magnetic field from at least one fault current flowing through said load wires;~~

~~multiple conductive windings with providing a first output voltage and a second output voltage, said multiple conductive windings and being magnetically coupled to said at least one magnetic core, wherein said first output is directly proportional to a ground fault level, and wherein said second output is directly proportional to a line fault level;~~

~~a first sensing circuit with first and second inputs, the first input of said first sensing circuit being electrically connected to the first output of said multiple conductive windings and monitoring said first output voltage, wherein said first sensing circuit detects ground fault conditions between at least one of said load wires and ground the second input of said first sensing circuit being electrically connected to the second output of said multiple conductive windings;~~

~~a second sensing circuit with first and second inputs, the first input~~

of said ~~second sensing circuit~~ being electrically connected to the ~~first output of~~
said multiple conductive windings and monitoring said second output voltage,
wherein said second sensing circuit detects line fault conditions between at
25 least two of said load wires ~~the second input of said second sensing circuit~~
~~being electrically connected to the second output of said multiple conductive~~
~~windings; and~~

a current interrupter printed wiring board circuit breaker with an
input and an output, the input of said current interrupter circuit being electrically
30 connected to an output of said first sensing circuit and an output of said second
sensing circuit, wherein said printed wiring board circuit breaker receives a
ground fault condition signal from said first sensing circuit or a line fault
condition signal from said second sensing circuit, wherein said printed wiring
board circuit breaker is tripped and generates the output of said current
35 interrupter circuit outputting an electronic fault signal when at least one of said
received fault condition signals exceeds a preset threshold; and wherein said
electronic fault signal activates an external circuit breaker system that is
electrically connected to said three-phase system to a switch when an electronic
fault is detected.

9. (currently amended) The module of claim 8, wherein at least
one each of said first and second sensing circuits includes:

an impedance with a first terminal and a first opposed terminal, the
first terminal of said impedance being electrically connected to ~~at least one of~~
5 ~~the first and second outputs of said multiple conductive windings,~~ wherein said
impedance is a load that provides a voltage drop in said first or second output
voltages;

a rectifier with a second terminal and a second opposed terminal,
the second terminal of said rectifier being electrically connected to the first
10 opposed terminal of said impedance, wherein said rectifier rectifies said
dropped voltage;

an electronic filter with a third terminal and a third opposed terminal, the third terminal of said electronic filter being electrically connected to the second opposed terminal of said rectifier, wherein said filter characteristics are adjusted to balance a trip time with a number of false trips, and wherein said filter filters said dropped voltage; and

a comparator with a fourth terminal and a fourth opposed terminal, the fourth terminal of said comparator being electrically connected to the third opposed terminal of said electronic filter, the fourth opposed terminal of said comparator being electrically connected to the input of said ~~current interrupter~~ printed wiring board circuit breaker.

10. (canceled)

11. (original) The module of claim 10 wherein said three phase circuit includes at least one switch capable of receiving the electronic fault signal.

12. (original) The module of claim 11 wherein said three phase circuit is electrically connected to at least one load impedance through said at least one switch.

13. (currently amended) The module of claim 12 wherein said three phase circuit and said at least one load impedance are electrically connected through a conductive interconnect which extends through said ~~at least one~~ magnetic core, said conductive interconnect being electrically connected in series with said at least one switch.

14. (currently amended) The module of claim 8 wherein the output of said first sensing circuit is electrically connected to a first input of an OR gate and the output of said second sensing circuit is electrically connected

5 to a second input of said OR gate wherein an output of said OR gate is electrically connected to the input of said ~~current interrupter~~ printed wiring board circuit breaker.

15. (canceled)

16. (currently amended) The module of claim 45 57, wherein said external electronic circuitry is in electrical communication with at least one of a fuel pump circuit, an engine circuit, and a gas pump circuit.

17. (currently amended) The module of claim 45 57, wherein said external electronic circuitry is positioned proximate to a flammable material.

Claims 18-22 (canceled)

23. (currently amended) A fault interrupter module comprising:
a relay socket module electrically connected to external electrical circuitry;
an ground and line fault interrupter adapter module fixedly
5 attached to said relay socket module, said adapter module including ~~electrical ground and line fault interrupter circuitry wherein said ground and line fault interrupter circuitry includes:~~
~~at least one a~~ magnetic core capable of detecting a magnetic field from at least one fault current;
10 multiple conductive windings ~~with~~ providing a first output and a second output voltage, said multiple conductive windings being magnetically coupled to said ~~at least one~~ magnetic core;
first and second sensing circuits ~~a current interrupter circuit~~ electrically connected to said multiple conductive windings, said ~~current~~
15 ~~interrupter circuit~~ sensing circuits being capable of detecting a ground fault from

the first output voltage of said multiple conductive windings and a line fault from the second output voltage of said multiple conductive windings;

20 a analog operating circuit breaker detector electrically connected to said sensing circuits, said circuit breaker outputting an electronic fault signal when at least one of the ground and the line faults are detected; and
 a relay module electromagnetically coupled with said electrical ground and line fault circuitry, said relay module being in electrical communication with said relay socket module through conductive interconnects extending through said ~~at least one~~ magnetic core, said relay module including
25 a switch electrically activated by the electronic fault signal.

24. (currently amended) A method of detecting an electronic fault in a circuit, the method comprising the steps of:

 detecting a magnetic field from a fault current flowing through a switch in said circuit using a magnetic core and multiple conductive windings
5 arranged on said magnetic core,
 converting said fault current into a ground fault signal and a line fault signal;
 measuring the ground fault signal by comparing the ground fault signal to a ground fault reference signal;
10 measuring the line fault signal by comparing the line fault signal to a line fault reference signal;
 constantly monitoring said fault signals;
 tripping a circuit breaker detector if at least one of said ground and line fault signals exceeds a threshold;
15 generating an electronic fault signal;
 opening said switch with said generated electronic fault signal to create an open circuit when the ground fault signal is greater than or equal to the ground fault reference signal; and
 opening said switch to create an open circuit when the line fault

20 signal is greater than or equal to the line fault reference signal.

25. (original) The method of claim 24 wherein said step of comparing the line fault signal to the line fault reference signal includes a step of measuring a voltage across an impedance.

26. (original) The method of claim 24 wherein said steps of comparing the ground fault signal to the ground fault reference signal includes a step of measuring a voltage across an impedance.

27. (original) The method of claim 24 wherein said step of opening said switch includes a step of flowing a ground fault current greater than one Amp through said switch.

28. (original) The method of claim 24 wherein said step of opening said switch includes a step of flowing a line fault current greater than 90 Amps through said switch.

29. (canceled)

30. (currently amended)The method of claim 24 wherein said step of detecting the magnetic field with said magnetic device includes a step of inducing a current in [[a]] said magnetic core.

31. (original) The method of claim 24 wherein said step of measuring the line and ground fault signals includes a step of rectifying at least one of the line and ground fault signals.

32. (original) The method of claim 31 wherein said step of measuring the line and ground fault signals includes a step of filtering at least

one of the line and ground fault signals.

33. (currently amended) A method of detecting an electronic fault in a circuit, the method comprising the steps of:

providing a three phase circuit electrically connected to an impedance load through at least one conductive interconnect and at least one switch;

measuring a current flowing through said at least one conductive interconnect to determine a ground fault signal and a line fault signal;

comparing the ground fault signal with a ground reference current and comparing the line fault signal with a line current;

generating an electronic fault signal if said ground fault signal or said line fault signal exceeds a preset threshold; and

opening said switch with said generated electronic fault signal to create an open circuit if the ground fault signal is greater than or equal to the ground reference current or if the line fault signal is greater than or equal to the line current.

34. (currently amended) The method ~~interrupter~~ of claim 33 wherein said step of measuring the current flowing through said at least one conductive interconnect includes measuring a magnetic field with multiple conductive windings.

35. (original) The method of claim 34, further including a step of choosing the ground and line currents by choosing a number of turns in said multiple conductive windings.

36. (original) The method of claim 33 wherein said step of comparing the ground fault signal with the ground reference signal and the line fault signal to the line reference signal includes a step of measuring a voltage

across an impedance.

37. (canceled)

38. (original) The method of claim 33 wherein said step of measuring the line and ground fault signals includes a step of rectifying at least one of the line and ground fault signals.

39. (original) The method of claim 38 wherein said step of measuring the line and ground fault signals includes a step of filtering at least one of the line and ground fault signals.

40. (original) The method of claim 39 wherein the step of filtering at least one of the line and ground fault signals includes a step of adjusting a frequency characteristic of an electronic filter to obtain a desired filter characteristic.

41. (currently amended) A method of providing electronic fault detection in a circuit, the method comprising the steps of:

providing at least one electrical circuit module in electrical communication with a connection in said circuit, said at least one first electrical circuit module including at least one electrical interconnect and at least one switch;

removing said at least one first electrical circuit module from said connection in said circuit;

providing an adapter module which includes electrical ground and line fault indicator circuitry, said adapter module being positioned in said connection in said circuit;

positioning said at least one electrical circuit module on said adapter module, said at least one electrical interconnect extending through said

electrical ground and line fault indicator circuitry to make electrical contact with
15 said circuit;

detecting a fault current flowing through said at least one first
electrical circuit module to said circuit with said electrical ground and line fault
indicator circuitry;

20 generating an electronic fault signal with said electrical ground and
line fault indicator circuitry;

transmitting a said electronic fault signal from said adapter module
to said at least one switch; and

opening said at least one switch when the said electronic fault
signal is detected by said at least one switch.

42. (canceled)

43. (new) A ground and line fault interrupter, comprising:

a magnetic core, wherein load wires of a three-phase system
extend through said magnetic core, said load wires providing three-phase
power to an electrical load;

5 multiple conductive windings wrapped around said magnetic core,
wherein arrangement of said windings on said magnetic core enables
monitoring of the current flow through said load wires and detection of
imbalances in the current flow;

10 a first sensing circuit electrically connected to said conductive
windings, wherein said first sensing circuit electronically monitors said
conductive windings and detects imbalances in the current flow through said
load wires that indicate ground fault conditions;

15 a second sensing circuit electrically connected to said conductive
windings, wherein said second sensing circuit electronically monitors said
conductive windings and detects imbalances in the current flow through said
load wires that indicate line fault conditions; and

an analog operating circuit breaker detector electrically connected to said first and second sensing circuits, wherein said circuit breaker detector receives a fault current from said first and second sensing circuits, and wherein
20 said circuit breaker detector is tripped and generates an electronic fault signal if said received fault current exceeds a preset threshold.

44. (new) The ground and line fault interrupter of Claim 43, wherein said electronic fault signal generated by said circuit breaker detector trips a circuit breaker of an external circuit breaker system that is electrically connected to said three-phase system.

45. (new) The ground and line fault interrupter of Claim 44, wherein said circuit breaker detector is a printed wiring board circuit breaker set to trip on a lower current draw than said circuit breaker of said external circuit breaker system.

46. (new) The ground and line fault interrupter of Claim 43, wherein said electronic fault signal generated by said circuit breaker detector trips a relay of an external relay system that is electrically connected to said three-phase system.

47. (new) The ground and line fault interrupter of Claim 43, wherein said first sensing circuit includes an impedance electrically connected to a comparator through an electronic filter and rectifier, wherein said impedance is a load that provides a voltage drop which is rectified and filtered, and wherein
5 the characteristics of said filter are adjusted to balance a trip time with a number of false trips.

48. (new) The ground and line fault interrupter of Claim 43, wherein said second sensing circuit includes an impedance electrically connected to a

comparator through an electronic filter and rectifier, wherein said impedance is a load that provides a voltage drop which is rectified and filtered, and wherein
5 the characteristics of said filter are adjusted to balance a trip time with a number of false trips.

49. (new) The ground and line fault interrupter of Claim 43, wherein said conductive windings are summed together to provide a first output voltage that is proportional to a ground fault level to said first sensing circuit and to provide a second output voltage that is proportional to a line fault level to said
5 second sensing circuit.

50. (new) The ground and line fault interrupter of Claim 43, wherein the outputs of the comparators of the first and second sensing circuits are electrically connected to said circuit breaker detector through an OR gate.

51. (new) The ground and line fault interrupter of Claim 43, further including a test circuit, wherein said test circuit is electrically connected to said conductive windings and enables manual input of a fault current.

52. (new) The ground and line fault interrupter of Claim 43, further including a power supply electrically connected to said conductive windings.

53. (new) The ground and line fault interrupter of Claim 52, wherein said power supply is a 115 VAC system without external connections.

54. (new) The ground and line fault interrupter of Claim 43, further including a reset circuit electrically connected to said circuit breaker detector, wherein said reset circuit enables the manual reset of said circuit breaker detector if tripped.

55. (new) A ground and line fault interrupter adapter module, comprising:

a plurality of relay interconnect throughholes capable of receiving external electrical interconnects of an electrical circuit module;

5 a plurality of socket pins extending said adapter module, wherein said socket pins provide electrical communication between said external electrical interconnects and a socket;

10 a plurality of bolt throughholes positioned proximate to the periphery of said adapter module, said throughholes receiving bolts that slide through, wherein said bolts secure said adapter module between said electrical circuit module and said socket; and

ground and line fault interrupter circuitry, including:

15 a magnetic core surrounding said socket pins, said magnetic core detecting a magnetic field from the current flowing through said socket pins;

multiple conductive windings wrapped around said magnetic core, said windings being arranged on said magnetic core to enable monitoring of the current flow through said socket pins;

20 first and second sensing circuits electrically connected to said conductive winding, said sensing circuits detecting imbalances of the current flow between said socket pins and between at least one of said socket pins and ground; and

25 a printed wiring board circuit breaker electrically connected with said first and second sensing circuits, said circuit breaker receiving a fault current from said sensing circuits, wherein said circuit breaker is tripped and generates an electronic fault signal when said received fault current exceeds a preset threshold, wherein said generated electronic fault signal is sent to said electrical circuit module.

56. (new) The ground and line fault interrupter adapter module of

Claim 55, wherein said ground and line fault interrupter circuitry further includes test circuit electronically connected to said conductive windings and reset circuit electronically connected to said circuit breaker and wherein said adapter
5 module includes a control circuit panel providing control switches for said test and reset circuits.

57. (new) The ground and line fault interrupter adapter module of Claim 55, wherein said socket is mounted on a panel, and wherein said panel is in electrical communication with said socket and external electronic circuitry.

58. (new) The ground and line fault interrupter adapter module of Claim 57, wherein said electrical circuit module includes a circuit breaker system, and wherein said electronic fault signal activates said circuit breaker system to interrupt the power supply for a load electrically connected with said
5 external electronic circuitry.